EA Engineering, Science, and Technology, Inc., PBC

405 S. Highway 121, Suite C-100
Lewisville, TX 75067
Telephone: 972-315-3922
Fax: 972-315-5181
www.eaest.com

27 April 2015

Mr. Stephen Tzhone
Task Order Monitor
U.S. Environmental Protection Agency (EPA)
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

RE: Field Investigation Summary Report, October 2014
Arkwood, Inc. Superfund Site
Remedial Investigation/Feasibility Study Oversight
EPA Region 6 Remedial Action Contract 2
Contract: EP-W-06-004
Task Order: 0100-RSBD-06A3

Dear Mr. Tzhone:

EA Engineering, Science, and Technology, Inc., PBC (EA) is pleased to submit the Field Investigation Summary Report for the soil sampling activities overseen by EA in October 2014 at the Arkwood, Inc. Superfund Site. The submitted document includes the Data Evaluation Summary Report for the data produced by the October 2014 field event.

An electronic copy of this document was transmitted via e-mail on 27 April 2015. We are providing one original hard copy and one electronic copy on compact disc.

If you have any questions regarding this submittal, please call me at (972) 459-5017.

Sincerely,

Ted Telisak, P.E.
Project Manager

Enclosure

cc: Michael Pheeny, EPA Contracting Officer (letter only)
Rena McClurg, EPA Project Officer (letter only)
Tim Startz, EA Program Manager (letter only via e-mail)
File

9595844

TRANSMITTAL OF DOCUMENTS FOR ACCEPTANCE BY EPA			DATE: **27 April 2015**	TRANSMITTAL NO.: **000006**
TO: **Mr. Stephen Tzhone** **U.S. Environmental Protection Agency Region 6**		FROM: **Ted Telisak** **EA Engineering, Science, and Technology, Inc., PBC**		
SUBTASK NO.	DELIVERABLE		NO. OF COPIES	
1.2.4	Field Investigation Summary Report, October 2014 Arkwood, Inc., Superfund Site Remedial Investigation/Feasibility Study Oversight		1 Hard Copy 1 Electronic Copy (compact disk) 1 Electronic Copy via E-Mail	
ACCEPTANCE ACTION				
DOCUMENTS FOUND ACCEPTABLE (LIST BY SUBTASK NO.)		NAME/TITLE/SIGNATURE OF REVIEWER DATE		

FIELD INVESTIGATION SUMMARY REPORT
OCTOBER 2014 FIELD EVENT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) OVERSIGHT
ARKWOOD, INC. SUPERFUND SITE, OMAHA, ARKANSAS

This Field Investigation Summary Report summarizes activities at the Arkwood, Inc. Superfund Site (the site) from 20-29 October 2014. It includes an introduction followed by discussions of health and safety issues, weather conditions, site activities, and a list of references.

INTRODUCTION

Under the direction of the U.S. Environmental Protection Agency (EPA), EA Engineering, Science, and Technology, Inc., PBC (EA) oversaw sampling activities conducted by the Potentially Responsible Parties' (PRP) consultant Oxford Environmental and Safety, Inc. (Oxford).

Participants included:

- Mr. Chris VanWart, EA Environmental Scientist, EA Site Manager/Site Health and Safety Officer
- Ms. Jean Mescher, McKesson Corporation, PRP Representative
- Mr. Jim Fleer, Oxford, PRP Environmental Consultant Site Manager
- Mr. Josh Johnson, Oxford, PRP Environmental Consultant Assistant Sampler
- Mr. Jamison Bear, Meta Environmental, PRP Environmental Consultant Subcontractor.

EA performed field activities in accordance with the following EPA-approved plans:

- RI/FS Oversight Work Plan (EA 2014a)
- Health and Safety Plan (EA 2014b)
- Sampling and Analysis Plan (EA 2014c).

This Field Investigation Summary Report reports on the oversight of incremental soil sampling efforts. The following attachments are included in this report:

- Attachment 1 – Daily Field Reports and Photos
- Attachment 2 – Field Logbook
- Attachment 3 – Site Location Map
- Attachment 4 – Chain-of-Custody Documentation for EA Collocated Samples
- Attachment 5 – EPA Contract Laboratory Program (CLP) Lab Data Reports
- Attachment 6 – PRP Lab Data Report
- Attachment 7 – Data Evaluation Summary Report.

HEALTH AND SAFETY

During the duration of the sampling effort, the team adhered to the Health and Safety Plan (EA 2014b).

WEATHER CONDITIONS

Weather conditions during sampling activities are shown in Table 1.

Table 1. Weather Conditions

Date	Temperature (°F)	Wind	Observation
20 October 2014	65 to 70	Light breeze	Slightly hazy conditions
21 October 2014	60s	Calm	Morning fog, clear afternoon skies
22 October 2014	45 to 70	Calm	Clear skies
23 October 2014	55s	Light breeze	Overcast skies
24 October 2014	46-78	Calm	Partly sunny skies
27 October 2014	57-70	Calm	Overcast skies
28 October 2014	70s	Light north-easterly winds	Sunny skies
29 October 2014	42-66	Calm	Sunny skies

SITE ACTIVITIES

From 20 to 29 October 2014, EA oversaw the collection of collocated quality control incremental samples (collocated samples). The following paragraphs summarize events noted in the field. More details may be found in the Daily Field Reports in Attachment 1 and in the Field Logbook in Attachment 2.

On 20 October 2014, EA and PRP representatives discussed the sampling approach and reviewed the selection of decision units (DUs), sampling units (SUs), and sampling grids. Oxford used random number generators to select SUs and sampling locations as described in the EPA-approved Work Plan. Oxford completed grids for the selected SUs within DU-1, which included SU-2, SU-4, and SU-5. Oxford also completed grids for the following SUs within DU-2: SU-9, SU-10, SU-17, and SU-19.

On 21 October 2014, Oxford began sampling at DU1-SU2 and concluded that the planned approach of using turf-coring equipment was ineffective at collecting samples. The project team quickly identified an alternative approach that involved using a 6-inch rock hammer to clear a 6-inch deep cut into the soil and then using the hammer blade to collect a soil sample from the full 6-inch deep profile, effectively collecting a representative soil volume that was an equivalent sample volume to what would have been collected using the turf coring devices. A consistent sample volume was established for each increment using a stainless steel bowl to visualize the volume prior to placing the increment into the larger 3-gallon stainless steel bucket that was used

for accumulating all 30 increments from the SU. The project team maintained logs for each increment, noting percent rock versus soil recovered in each increment. Oxford collected the following samples: DU-1-SU2, DU1-SU-4, DU1-SU5, and DU2-SU17.

On 22 October 2014, Oxford continued collecting incremental soil samples from DU2. Oxford collected samples from the following locations: DU2-SU9, DU2-SU10, DU2-SU19, DU2-SU28, and DU2-SU36. EA received a collocated sample from location DU2-SU28; this sample was designated E- DU2-SU28. There were no significant variances from protocols established on 21 October 2014. There were two locations where the sampling team encountered a visible crushed-rock layer at approximately 6 inches below ground surface (bgs), which may have been an indication of the depth of soil cap in these locations. In all other areas within DU2, the soil cap appeared to extend beyond 6 inches bgs. EA noted a cut section of fence on the northern side of the site, at the northern border of DU2-SU10. Mr. Fleer indicated that he will notify site maintenance personnel to have the fence section repaired.

On 23 October 2014, Oxford collected incremental soil samples from DU2 and DU7. Oxford collected samples from the following locations: DU2-SU30, DU2-SU44, and DU7-SU1. Three replicate samples were collected from DU2-SU30. DU2-SU44 overlapped with the storm water drainage swale designated as DU4. Therefore, if planned sample locations within DU2-SU44 were within the drainage swale area, no increment was collected – these areas will be characterized by incremental samples collected from DU4. In order to ensure that 30 increments were collected from DU2-SU44, the SU was divided into 36 sample grids. A total of 6 sample grids overlapped with DU4 and were not sampled. EA received a collocated sample from location DU7-SU1; this sample was designated E- DU7-SU1. Due to extremely rocky soil, several increments at DU-7-SU1 were taken at approximately 0 to 5 inches bgs as opposed to 0 to 6 inches bgs.

On 24 October 2014, Oxford collected incremental soil samples from locations DU4-SU1 and DU4-SU2. Collection of increments from DU4 was difficult due to the ballast rock lining the bottom of the ditch. Each sample often required removal of overburden before reaching soil that could be sampled. There were several locations within each SU where increments could not be collected from the bottom of the ditch due to ballast rock that extended beyond 12 inches deep. Soil in these locations could not be reached; therefore, increment samples were moved to the drainage ditch bank closest to the active site, where there was less ballast rock and soil could be obtained for sampling. Soils were extremely rocky throughout DU4, and several increments were collected from depths of 3 to 5-inches bgs rather than the anticipated 0 to 6-inches bgs. In addition to sampling oversight, EA observed where the decontamination water was being disposed into the treatment system at the New Cricket Spring Treatment Facility.

On 27 October 2014, Oxford collected incremental soil samples from locations DU3-SU1, DU3-SU2, and DU5-SU1. Location DU5-SU1 was sampled in triplicate. EA received a collocated sample from the first replicate sample at this location; the collocated sample was designated E- DU5-SU1. There were several locations within DU5 where increments could not be collected from the randomly selected increment sample point because the quantity of ballast rock extended beyond 12 inches deep. Soil in these locations could not be reached; therefore,

increment samples were moved approximately 18 inches to the nearest location where there was less ballast rock and soil could be obtained for sampling. Soils were extremely rocky throughout DU5 and several increments were collected from 0 to inches bgs rather than the anticipated 0 to 6-inches bgs.

On 28 October 2014, Oxford collected incremental soil samples from locations DU6-SU1, DU6-SU2, and DU6-SU3. Sample grids DU6-SU2 and DU6-SU3 each contained an outbuilding structure; therefore, if the randomly selected increment sample location was within the footprint of the outbuilding, the increment was skipped. This resulted in one increment skipped in DU6-SU2, and one increment skipped in DU6-SU3. Both samples collected from these SUs were composed of 34 increments. Location DU6-SU1 was sampled in triplicate. The sample grid in DU6-SU1 overlapped with the concrete former decontamination pad, as well as portions of the southern drainage ditch (DU4). If the randomly selected increment sample was located on the concrete pad, no sample could be collected and the increment was skipped. Similarly, if the increment sample was located within the ditch designated as DU4, no increment was collected because the ditch had already been sampled earlier in the week. In order to ensure an adequate number of increments would be collected from DU6-SU1, the team divided the SU into 49 grids. All three replicates collected from SU1 were composed of greater than 30 increments each. Soils were very rocky throughout DU6-SU1, and several increments were collected from 0 to 5-inches bgs rather than the anticipated 0 to 6-inches bgs. Increment volumes remained constant in all locations. During collection of the second replicate sample from DU6-SU1, one increment location had to be moved 18-inches west of the selected location because the quantity of gravel extended beyond 12-inches deep and no soil could be obtained.

On 29 October 2014, Oxford containerized and disposed of decontamination water at the New Cricket Spring Treatment Facility. Upon return, Oxford finished collection of location coordinates for sample unit corners and cleaned up the office/workspace in the silo area. EA shipped the collocated samples to the laboratory for analysis. The EA collocated samples were sent to the CLP laboratory located in Sacramento, California. A copy of the chain-of-custody documentation is included in Attachment 4.

Three incremental soil samples were delivered by EA to the designated CLP Laboratory (TestAmerica Laboratories, Inc.) in Sacramento, California. The PRP samples were submitted to Vista Analytical Laboratory, located in El Dorado Hills, California. The chain-of-custody documentation for the EA collocated samples is included in Attachment 4. The reports provided by the CLP Laboratory may be found in Attachment 5. The reports provided by the PRP laboratory may be found in Attachment 6.

After receiving the PRP data, EA computed the relative percent difference (RPD) between the EPA lab and the PRP lab collocated sample mammalian toxicity equivalence factor (TEQ) results (Table A-1 of Attachment 7). The RPD was computed using the following formula:

$$\text{RPD} = \frac{\text{Absolute value of difference between results of two laboratories}}{\text{Average of results of two laboratories}} \times 100\%$$

A determination of adequate agreement between the EPA lab and the PRP lab results was conducted by comparing the RPD of each analyte to the maximum acceptable RPD of 50% established in the discussion of Data Quality Objectives in EA's Sampling and Analysis Plan (EA 2014b). The results of this determination are presented in Table A-1 of Attachment 7. If the calculated RPD is less than 50 percent, then the EA collocated samples and the corresponding PRP samples are considered to be within adequate agreement. The calculated RPDs were within the 50 percent criterion.

Field Sampling Plan Deviations

The following is a summary of deviations from the PRP Work Plan (Oxford 2014) noted by EA personnel during oversight. Additional information can be found in the Daily Field Report and Field Logbook (Attachments 1 and 2, respectively).

- Oxford collected soil increments in 1-liter amber glass jars, as opposed to the approved Work Plan which states the increments were to be collected in 1-gallon polyethylene bags. Oxford indicated the decision was made to be in agreement with the laboratory protocol for dioxin samples, which calls for amber glass jars. EA collected the collocated samples into polyethylene bags, per the Sampling and Analysis Plan (EA 2014c).
- Oxford stated the figure in their Work Plan was adjusted to ensure the selected SUs were 0.25 acres in size. Although the revised layout varied from the Work Plan, it was true to the intended sample approach.
- Due to the presence of rocky soil, the planned coring method could not be used to collect samples. Instead, Oxford used a 6-inch rock hammer to clear a 6-inch deep cut into the soil and then a hammer blade to collect a soil sample from the full 6-inch deep profile.
- Due to rocky soil, several increments at DU7-SU1 were taken at approximately 0 to 5 inches bgs as opposed to 0 to 6 inches bgs.
- Due to rocky soil, several increments in DU4 and DU5 were collected from depths of 3 to 5 inches bgs rather than the anticipated 0 to 6 inches bgs.
- There were several locations within DU5 where increments could not be collected because the quantity of ballast rock extended beyond 12 inches deep. Therefore, increment samples were moved approximately 18 inches to the nearest location where there was less ballast rock and soil could be obtained for sampling.
- Soils were very rocky throughout DU6-SU1, and several increments were collected from 0 to 5 inches bgs rather than the anticipated 0 to 6-inches bgs.
- During collection of the second replicate sample from DU6-SU1, one increment location had to be moved 18-inches west of the selected location because the quantity of gravel extended beyond 12-inches deep and no soil could be obtained.

REFERENCES

EA Engineering, Science, and Technology, Inc. (EA). 2014a. Remedial Investigation/Feasibility Study Oversight Work Plan. Arkwood, Inc. Superfund Site. Omaha, Boone County, Arkansas. March.

EA. 2014b. Health and Safety Plan. Remedial Investigation/Feasibility Study Oversight Work Plan. Arkwood, Inc. Superfund Site. Omaha, Boone County, Arkansas. June.

EA. 2014c. Sampling and Analysis Plan. Remedial Investigation/Feasibility Study Oversight Work Plan. Arkwood, Inc. Superfund Site. Omaha, Boone County, Arkansas. October.

Oxford Environmental and Safety, Inc. (Oxford). 2014. Work Plan for Implementation Decision Unit Plan Sampling and Analysis, Arkwood, Inc. Site, Old Cricket Road, Omaha, Arkansas. 29 August.

ATTACHMENT 1

DAILY FIELD REPORT AND PHOTOS

(Submitted as a hard copy)

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ATTACHMENT 2

FIELD LOGBOOK
(Submitted as a hard copy)

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ATTACHMENT 3

SITE LOCATION MAP

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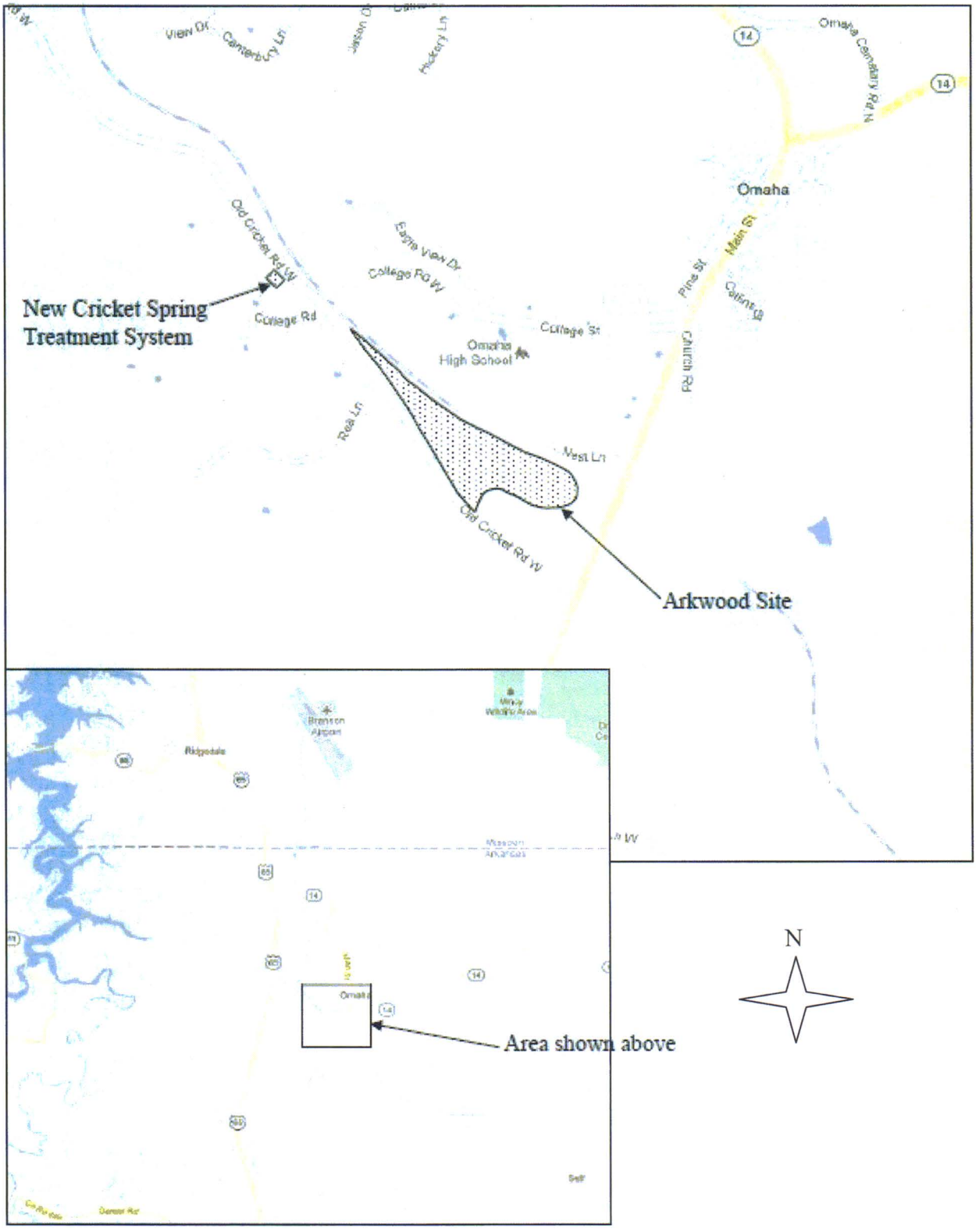
Site Location Map



ATTACHMENT 4

CHAIN-OF-CUSTODY DOCUMENTATION FOR EA COLLOCATED SAMPLES

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EA Engineering, Science, and Technology, Inc.

405 S. Highway 121, Suite C-100
Lewisville, TX 75067
Telephone: 972-315-3922
Fax: 972-315-5181
www.eaest.com

12 November 2014

Ms. Myra Perez
U.S. Environmental Protection Agency (EPA)
Region 6 Contract Laboratory Program Regional Sample Control Coordinator
10625 Fallstone Road
Houston, Texas 77099

RE: Submittal of Region Chain of Custody Records
Arkwood, Inc., Superfund Site
Remedial Investigation / Feasibility Study Oversight
U.S. EPA Region 6 Remedial Action Contract 2
Contract: EP-W-06-004
Task Order: 0100-RSBD-06A3

Dear Ms. Perez:

EA Engineering, Science, and Technology, Inc. (EA) is enclosing one (1) original Region Chain of Custody Record for the recent sampling event conducted in support of the above-referenced Task Order, EPA Contract Laboratory Program Case Number 44761.

If you have any questions regarding this information, please call me at (972) 459-5017.

Sincerely,

Ted Telisak, P.E.
Project Manager

Enclosure(s)

cc: Stephen Tzhone, EPA Task Order Monitor (email only)
File

USEPA CLP Organics COC (REGION COPY)

DateShipped: 10/29/2014

CarrierName: FedEx

AirbillNo: 7716 6145 6611

CHAIN OF CUSTODY RECORD

Arkwood Inc. Superfund Site/AR

Case #: 44761

No: 6-101514-115846-0152

Lab: TestAmerica Laboratories, Inc - Sacramento - TALCA

Lab Contact: Robert Weidenfeld

Lab Phone: 916-374-4333

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
E-DU2-SU28	DF6A0	Soil/ Chris VanWart	ISM	Dx/F(21)	6-442593 (Ice to 4C) (1)	E-DU2-SU28	10/22/2014 16:15	Field Sample
E-DU5-SU1	DF6A01	Soil/ Chris VanWart	ISM	Dx/F(21)	6-442594 (Ice to 4C) (1)	E-DU5-SU1	10/27/2014 14:02	Field Sample
E-DU7-SU1	DF6A02	Soil/ Chris VanWart	ISM	Dx/F(21)	6-442595 (Ice to 4C) (1)	E-DU7-SU1	10/23/2014 17:10	Field Sample

Special Instructions: These samples will be collected using the "Incremental Soil Sampling Methodology (ISM)". Special sample preparation is required prior to analysis, the lab must follow prep instructions indicated in MA 2426.0.

Shipment for Case Complete? Y

Samples Transferred From Chain of Custody #

Analysis Key: Dx/F=DLM02.2 and MA # 2426.0

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	EA	10-24-14/10:25			

ATTACHMENT 5

EPA CLP LAB DATA REPORTS
(Submitted on compact disc)

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ATTACHMENT 6

PRP LAB DATA REPORTS
(On compact disc)

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ATTACHMENT 7

DATA EVALUATION SUMMARY REPORT

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Data Evaluation Summary Report

Remedial Investigation/Feasibility Study Oversight
Arkwood, Inc. Superfund Site
Omaha, Boone County, Arkansas
EPA Identification No. ARD084930148

Remedial Action Contract 2
Contract: EP-W-06-004
Task Order: 0100-RSBD-06A3

Prepared for
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733

Prepared by
EA Engineering, Science, and Technology, Inc., PBC
405 S. Highway 121
Building C, Suite 100
Lewisville, Texas 75067
(972) 315-3922

April 2015
Revision: 00
EA Project No. 14342.100

CONTENTS

PAGE

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

bgs	Below ground surface
CLP	Contract Laboratory Program
CRDL	Contract-Required Detection Limit
CRQL	Contract-Required Quantitation Limit
DESR	Data Evaluation Summary Report
DQO	Data quality objectives
EA	EA Engineering, Science, and Technology, Inc., PBC
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
LCS	Laboratory control sample
MDL	Method detection limit
OCDD	Octachlorodibenzodioxin
OCDF	Octachlorodibenzofuran
PARCCS	Precision, accuracy, completeness, comparability, representativeness, and sensitivity
PRP	Potentially responsible party
QA	Quality assurance
QC	Quality control
RI	Remedial Investigation
RPD	Relative percent difference
SAP	Sampling and Analysis Plan
Site	Arkwood, Inc. Superfund Site
SOP	Standard operating procedure
SOW	Statement of Work
TCDD-TEQ	Tetrachlorodibenzodioxin toxicity equivalent
TEQ	Toxicity equivalence factor

1. INTRODUCTION

This document presents the Data Evaluation Summary Report (DESR) prepared by EA Engineering, Science, and Technology, Inc., PBC (EA) for the Arkwood, Inc. Superfund Site (site), located in Omaha, Boone County, Arkansas. This DESR documents and summarizes the analytical data collected during the Remedial Investigation (RI) and Feasibility Study (FS) oversight activities in October 2014. EA produced this DESR for the U.S. Environmental Protection Agency (EPA) Region 6 as part of Task Order No. 0100-RSBD-06A3 under Remedial Action Contract No. EP-W-06-004, in accordance with the Statement of Work (SOW) issued by EPA (EPA 2014).

The purpose of the field investigation was to collect sufficient data to support RI/FS oversight for the site. The media sampled in October 2014 included incremental soil samples. The EPA SOW (EPA 2014) and the EPA-approved Work Plan (EA 2014a) set forth the framework and requirements for this effort.

The purpose of the DESR is presented in Section 2. A data summary that compiles, tabulates, and summarizes the data collected during the October 2014 RI/FS activities is provided in Section 3. The quality assurance (QA)/quality control (QC) findings are presented in Section 4. Data evaluation parameters are presented in Section 5. The data quality objective (DQO) evaluation and conclusions are presented in Section 6. References are provided in Section 7. Supporting materials follow the text.

2. PURPOSE

The purpose of this DESR is to summarize the analytical data quality and usability as related to the project-specific DQOs presented in the Sampling and Analysis Plan (SAP) (EA 2014b). The DQO process is a series of planning steps designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended application. The project-specific DQOs for the RI/FS oversight process were developed and presented in the SAP. The methods and techniques required to yield analytical data of acceptable quality and quantity to support DQOs are also outlined in the SAP.

The overall QA objectives are as follows:

- Attain QC requirements for analyses specified in the SAP
- Obtain data of known quality to verify the potentially responsible party's (PRP) assessment of nature and extent of contamination and human health and ecological risks

- Document the performance of the PRP's quality program, including performance of the work and any required changes to work at the site.

In order to address the goals of the study, incremental soil samples were collected as outlined in the SAP and were analyzed for chlorine-substituted dibenzo-p-dioxins and dibenzofurans by Contract Laboratory Program (CLP) method DLM02.2.

3. DATA SUMMARY

This section presents a summary of the data collected during the field investigation. Media sampled included incremental soil samples. Analytical results are presented in Appendix A. A summary of the dioxin data review is reported in Appendix C.

EA received collocated quality control incremental soil samples (collocated samples) from locations DU2-SU28, DU7-SU1, and DU5-SU1. Due to the specific requirements of incremental sampling methods, the collocated samples were created by aggregating a second set of soil increments collected directly adjacent to the PRP's parent sample. The PRP collected the soil core and placed each collocated increment into the sample container carried by EA personnel during sampling activities. The collocated samples were prepared for analysis using the same methodology as the laboratory contracted by the PRP (Oxford 2014) and were analyzed for chlorine-substituted dibenzo-p-dioxins and dibenzofurans by CLP method DLM02.2. The mammalian tetrachlorodibenzodioxin toxicity equivalent (TCDD TEQ) results are summarized in Table A-1 in Appendix A.

4. QUALITY ASSURANCE/QUALITY CONTROL

This section describes the QA/QC findings for the analytical data provided by the supporting laboratory. A complete listing of analyses is presented in the project-specific SAP (EA 2014b). The project field samples were collected and sent to the CLP Laboratory. The following paragraphs present the QA/QC results of the project data.

According to the requirements of the project-specific SAP (EA 2014b), the responsibility for the validation and review of the data from the CLP laboratory was held by the EPA. EA reviewed the electronic deliverables from the CLP Laboratory and determined that they contained suitable data validation qualifiers and accompanying case narratives.

In preparing this DESR, the available data validation reports and case narratives were reviewed. The QC findings are summarized in the following paragraphs and only address those issues that resulted in the qualification of data. Other minor findings that were deemed insignificant to data quality are discussed in individual reports included in Appendix B of this report.

The data generated by the CLP laboratory were reviewed in accordance with the laboratory policy. The CLP laboratory performed chlorine-substituted dibenzo-p-dioxins and dibenzofurans analyses by CLP method DLM02.2.

The qualifiers and definitions used for the CLP laboratory data are presented in Table 1 (below). The laboratory deliverable included appropriate data qualifiers and an accompanying data summary. Appendix B of this DESR contains the analytical data report and narrative from the CLP laboratory for samples collected in October 2014.

The CLP laboratory data did not require validation by EA as specified in the project-specific SAP (EA 2014b). The laboratory report contained a narrative with general information regarding data quality. The laboratory did not reject any data, so the data were usable as reported. The issues reported in the narrative are summarized below.

- **Report for samples collected in October 2014: Report DF6A0:**
  - The Octachlorodibenzodioxin (OCDD) results were qualified as estimated for all samples due to the concentrations exceeding the calibration limit.

TABLE 1 EPA REGION 6 DATA VALIDATION QUALIFIERS

Qualifier	Definition
Data Qualifier Definitions for Organic Data Review	
ND or U	The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted Contract-Required Quantitation Limit (CRQL) for sample and method.
J	The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample (due to either the quality of the data generated because certain QC criteria were not met, or the concentration of the analyte was below the CRQL).
B	Blank Related. The concentration found in the sample was less than ten times the concentration found in the associated extraction, digestion, and/or analysis blank. Presence in the sample is therefore suspect.
UJ	The analyte was not detected at a level greater than or equal to the adjusted CRQL. However, the reported adjusted CRQL is approximate and may be inaccurate or imprecise.
v	Low biased. Actual concentration may be higher than the concentration reported.
^	High biased. Actual concentration may be lower than the concentration reported.
L	Reported concentration is below the CRQL.
M	Reported concentration should be used as a raised quantitation limit because of interferences and/or laboratory contamination.

5. DATA EVALUATION PARAMETERS

The data were evaluated for acceptable quality and quantity based on the critical indicator parameters, represented by precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS). To the extent possible, EA followed EPA's data quality assessment process (EPA 2006a; 2006b). This evaluation helps determine whether limitations should be placed on the data and to verify that the type, quality, and quantity of data that are collected are appropriate for their intended use. The PARCCS parameters were reviewed for the laboratory analytical data results and are discussed in the following sections.

A well-defined QA/QC process is integral to the generation of analytical data of known and documented quality. The QC process includes those activities required during data collection to produce data of sufficient quality to support the decisions that will be made based on the data (e.g., comparison to the PRP sample data). After environmental data are collected, QA activities focus on evaluating the quality of the data in order to determine the data usability with respect to support for remedial or enforcement decisions. Table 2 presents the acceptance criteria for definitive laboratory data for chemical analyses of investigation samples only.

5.1 DATA CATEGORIES

In order to produce data suitable for decision-making, an appropriate analytical technique must be selected. The EPA Superfund program has developed two descriptive categories of analytical techniques: (1) field-based techniques and (2) fixed-laboratory techniques. The type of data generated depends on the qualitative and quantitative DQOs developed for a project. Regardless of how the data were analyzed, they must be of adequate quality for the decision-making process for which they were collected. For this project, analysis was performed using fixed laboratory techniques.

Rigorous analytical methods (e.g., EPA CLP methods) are used to generate analyte-specific, definitive data. The definitive quality of the data is assured by: (1) using standard operating procedures (SOPs) and QC processes during data collection; (2) documented control and traceability of reference standards, calibrations, and instrument performance; and (3) acceptable performance of field and laboratory QC procedures within the defined limits established for these procedures.

TABLE 2 QUALITY ASSURANCE INDICATOR CRITERIA

Indicator Parameter	Analytical Parameter	QC Sample	Acceptance Criteria for Laboratory Analysis
Accuracy (percent recovery)	Dioxins/Furans	LCS	Compound-specific limits in Table 6 of DLM02.2
		Labeled compounds	Compound-specific limits in Table 7 of DLM02.2
		Blanks	Less than CRQL or less than 10% of level in associated samples except for OCDD and OCDF (less than 3 times the CRQL)
Precision (RPD)	Dioxins/Furans	Collocated samples and laboratory replicates	50 percent RPD
Completeness	The objective for data completeness is 90 percent.		
Representativeness and Bias	The sampling network analytical methods for this site are designed to provide data that are representative of site conditions.		
Comparability	The use of standard published sampling and analytical methods and the use of QC samples will ensure data of known quality. These data can be compared to other data of known quality.		

NOTE:
CRQL = Contract-required quantitation limit
LCS = Laboratory control sample
OCDD = Octachlorodibenzodioxin
OCDF = Octachlorodibenzofuran
RPD = Relative percent difference.

The soil samples collected by EA were analyzed by an EPA CLP laboratory.

5.2 MEASUREMENT QUALITY OBJECTIVES

Analytical results were evaluated in accordance with PARCCS parameters to document the quality of the data and to ensure that the data are of sufficient quality to meet the project objectives. Of these PARCCS parameters, precision and accuracy were evaluated quantitatively by collecting the QC check samples listed in Table 2.

The sections below describe each of the PARCCS parameters and how they were assessed within this project.

5.2.1 Precision

Precision is the degree of mutual agreement between individual measurements of the same property under similar conditions. Usually, combined field and laboratory precision is evaluated by collecting and analyzing field duplicates and then calculating the variance between the samples, typically as a relative percent difference (RPD).

RPD is calculated as follows: $$RPD = \frac{|A - B|}{(A + B)/2} \times 100\%$$

where: A = first duplicate concentration
B = second duplicate concentration.

RPD evaluations are documented in the individual laboratory report for the sample delivery group which was validated for laboratory replicate pairs. The RPDs between the collocated samples and the PRP samples was also evaluated. A comparison of the PRP samples and the collocated samples collected by EA and a comparison of the EA collocated samples and the CLP laboratory replicate samples are discussed in Section 5.2.5.

5.2.2 Accuracy

Accuracy is the degree to which a measurement agrees with its true value and is expressed as percent recovery; acceptance criteria for each analytical methodology are stated in the SAP. Accuracy is assessed by comparing laboratory control samples (LCS) and labeled compounds to associated QC limits. Through the process of data validation and review LCS and labeled compound recoveries were evaluated for compliance with acceptance criteria for accuracy for each applicable analytical methodology.

LCSs or blank spikes are analyzed at a frequency of 5 percent. Labeled compounds, where available, are added to every sample analyzed for organic constituents. The results of the spiked samples are used to calculate the percent recovery for evaluating accuracy. The evaluations of percent recovery are documented in Appendix B.

$$\text{Percent Recovery} = \frac{S - C}{T} \times 100\%$$

where: S = measured spike sample concentration
C = sample concentration
T = true or actual concentration of the spike.

5.2.3 Representativeness

Representativeness is a qualitative parameter and is defined by the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or a process or environmental condition. Representativeness requirements would be satisfied by: (1) ensuring the SAP (EA 2014b) and the PRP Field Sampling Plan (Oxford 2014) are followed; (2) verifying that samples are collected in accordance with the appropriate PRP SOPs listed in their SAP, or that appropriate sampling techniques are used when

PRP SOPs are not available; (3) following proper analytical procedures; and (4) not exceeding required maximum holding times.

EA verified the PRP SOPs and sampling plan were generally followed with the following exceptions:

- Oxford collected soil increments in 1-liter amber glass jars, as opposed to the approved Work Plan which states the increments were to be collected in 1-gallon polyethylene bags. Oxford indicated the decision was made to be in agreement with the laboratory protocol for dioxin samples, which calls for 1-liter amber glass jars. EA collected the collocated samples into polyethylene bags, per the SAP.

- Oxford stated the figure in their Work Plan was adjusted to ensure the selected SUs were 0.25 acres in size. Although the revised layout varied from the Work Plan, it was true to the intended sample approach.

- Due to the presence of rocky soil, the planned coring method could not be used to collect samples. Instead, Oxford used a 6-inch rock hammer to clear a 6-inch deep cut into the soil and then a hammer blade to collect a soil sample from the full 6-inch deep profile.

- Due to rocky soil, several increments at DU7-SU1 were taken at approximately 0 to 5 inches below ground surface (bgs) as opposed to 0 to 6 inches bgs.

- Due to rocky soil, several increments in DU4 and DU5 were collected from depths of 3 to 5 inches bgs rather than the anticipated 0 to 6 inches bgs.

- There were several locations within DU5 where increments could not be collected because the quantity of ballast rock extended beyond 12 inches deep. Therefore, increment samples were moved approximately 18 inches to the nearest location where there was less ballast rock and soil could be obtained for sampling.

- Soils were very rocky throughout DU6-SU1 and several increments were collected from 0 to 5 inches bgs rather than the anticipated 0 to 6-inches bgs.

- During collection of the second replicate sample from DU6-SU1, one increment location had to be moved 18-inches west of the selected location because the quantity of gravel extended beyond 12-inches deep and no soil could be obtained.

Further information can be found in the Daily Field Reports and Field Logbook, which are included in the Field Investigation Summary Report.

Samples were analyzed using standard laboratory analytical methods. The PRP and EA collocated samples were analyzed within the holding time specified by the analytical methods.

Minor QC issues affecting the results are identified in the laboratory case narratives.

5.2.4 Completeness

Completeness is defined as the percentage of measurements judged to be valid. The validity of sample results is determined through the data validation process. No data were rejected. The data that are qualified as estimated (J) or estimated nondetected (UJ) are considered to be valid and usable. The completeness is calculated and reported for each method and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set.

The percent completeness was acceptable. The sample results were acceptable, resulting in 100 percent completeness for the overall project.

5.2.5 Comparability

Comparability of the data is a qualitative parameter that expresses the confidence with which one data set may be compared to another. Comparability is attained by achieving the QA objectives for sensitivity, accuracy, precision, completeness, and representativeness and would be measured by calculating the RPD between the PRP and EA collocated samples. If the calculated RPD is less than 50 percent, then the EA collocated samples and the corresponding PRP samples are considered to be within adequate agreement. The calculated RPDs were within the 50 percent criterion (the highest RPD observed was 47% for DU2SU28). The calculated RPDs are summarized in Table A-1.

In addition, the EA collocated samples were compared with laboratory replicate samples (Table A-2). The highest RPD between the EA collocated sample and laboratory replicate was 15%, well below the 50 percent measurement quality objective. This demonstrates that the laboratory subsampling procedure was effective for producing a viable incremental sample.

5.2.6 Sensitivity

Sensitivity is the measure of the signal from an instrument that represents an actual deflection or response above instrument noise. The analytical sensitivity is measured by the method detection limit (MDL) and reported with the necessary dilution factors, preparation factors, and dry-weight factors of an individual sample as the sample quantitation limit.

Ideally the lowest of the detection limits outlined by the laboratories would be below human health screening levels; analytically achievable quantitation limits are not always low enough to meet this goal. In such cases, the laboratory should analyze the target analyte at the lowest achievable detection limit according to the PRP's Work Plan (Oxford 2014).

Concentrations of TCDD congeners observed in most collocated samples were well above detection limits, in fact, concentrations of OCDD were so high that they exceeded the calibration range. The validation report discusses this exceedance and indicates that this does not significantly affect the data quality.

5.3 DETECTION AND QUANTITATION LIMITS

The analytical parameters and their quantitation limits for use on this project are determined under the EPA CLP SOW(s). The Contract-Required Detection Limit (CRDL) is the minimum concentration of an analyte that can be reliably distinguished from background noise for a specific analytical method. The quantitation limit represents the lowest concentration of an analyte that can be accurately and reproducibly quantified in a sample matrix. CRQLs are contractually specified maximum quantitation limits for specific analytical methods and sample matrices, such as air, soil, or water, and are typically several times the MDL to allow for matrix effects.

For this project, sample results were reported as estimated values if concentrations were less than CRQLs but greater than CRDLs. The CRQL for each analyte was listed as the detection limit in the laboratory's electronic data deliverable.

6. DATA QUALITY OBJECTIVES AND CONCLUSIONS

Based on the data validation findings summarized in Section 4, the EPA collocated sample data were either determined to be usable or usable as qualified.

One of the goals in the field investigation was to obtain collocated sample results of known quality that can support the RI/FS oversight. Based upon an overall review of the results presented within this DESR, the following issues are of importance in this evaluation.

6.1 MEDIA VARIABILITY

EA collocated sample results were compared to the PRP sample results in order to help determine the following: (1) if the PRP sampling process was consistent with their field sampling plan, and (2) if the PRP laboratory was properly reporting data. The mammalian toxic equivalent sample results were within the acceptable RPD criterion as discussed in Section 5.2.5. Overall, the collocated sample results were comparable to the PRP sample results. The RPD between the EA collocated samples and the laboratory replicate samples were also with the acceptable RPD criterion.

6.2 LABORATORY PERFORMANCE PROBLEMS

In general, the laboratory performance met QC limits. Refer to Section 4 for a more detailed discussion of any laboratory performance issues.

6.3 CONCLUSIONS

The collocated sample analytical results for this sampling event met overall project objectives for the quantity and quality of data required to support the decision-making process of this investigation. The EPA data were acceptably comparable to the PRP data. The analytical results from the PRP and EA indicate that the incremental sampling method was acceptable for the performed samples.

Data without qualifiers and data qualified as estimated are usable for purposes in supporting project objectives. The EPA collocated sample data were validated and determined to be usable by the data reviewer.

7. REFERENCES

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Appendix A

Data Summary Tables and Relative Percent Difference Calculations

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Table A-1 Comparison of EA and PRP Collocated Samples

				Sample Identifier	E-DU2-SU28		DU2SU28			E-DU5-SU1-1		DU5SU1-1			E-DU7-SU1-1		DU7SU1		
				Laboratory Identifier	320-10162-1		1400798-02			320-10162-2		1400804-03			320-10162-3		1400800-02		
				Sample Type	Collocated sample		Primary		Relative Percent Difference	Collocated Sample		Primary		Relative Percent Difference	Collocated Sample		Primary		Relative Percent Difference
				Date Collected	10/22/2014		10/22/2014			10/22/2014		10/22/2014			10/22/2014		10/22/2014		
	CASRN	**Screening Level**	**Units**		**Result**	**Q**	**Result**	**Q**		**Result**	**Q**	**Result**	**Q**		**Result**	**Q**	**Result**	**Q**	
Dioxins																			
Total TEQ (Mammal)	*3333-30-0*	*730*	*ng/kg*		288		463		46.6	**1800**		**1777**		-1.3	**8450**		**5506**		-42.2

NOTES:

Results shown in bold and highlighted blue equal or exceed the screening criteria listed.

The relative percent difference has been calculated for each duplicate pair and is reported in the table above.
CASRN = Chemical Abstracts Service Registry Number
TEQ = toxicity equivalence factor
ng/kg = nanogram(s) per kilogram

Table A-2 Comparison of EA Laboratory Replicate Samples

				Sample Identifier	E-DU2-SU28		E-DU2-SU28-2			E-DU5-SU1-1		E-DU5-SU1-2			E-DU7-SU1-1		E-DU7-SU1-2		
				Laboratory Identifier	320-10162-1		320-10162-4			320-10162-2		320-10162-5			320-10162-3		320-10162-6		
				Sample Type	Primary		Laboratory Replicate		Relative Percent Difference	Primary		Laboratory Replicate		Relative Percent Difference	Primary		Laboratory Replicate		Relative Percent Difference
				Date Collected	10/22/2014		10/22/2014			10/22/2014		10/22/2014			10/22/2014		10/22/2014		
	CASRN	**Screening Level**	**Units**		**Result**	**Q**	**Result**	**Q**		**Result**	**Q**	**Result**	**Q**		**Result**	**Q**	**Result**	**Q**	
Dioxins																			
Total TEQ (Mammal)	*3333-30-0*	*730*	*ng/kg*		288		333		14.5	**1800**		**1840**		2.2	**8450**		**8920**		5.4

NOTES:

Results shown in bold and highlighted blue equal or exceed the screening criteria listed.

The analytical laboratory generated an internal replicate for each field sample as a means of accounting for variance due to sample preparation and processing.

The relative percent difference has been calculated for each replicate pair and is reported in the table above.

The greater of the two reported concentrations should be used for risk management purposes. This is consistent with typical data handling procedures used in context of a risk assessment.

CASRN = Chemical Abstracts Service Registry Number

TEQ = toxicity equivalence factor

ng/kg = nanogram(s) per kilogram

Appendix B

Laboratory Analytical Reports and Case Narratives

(On compact disc)

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Appendix C

Data Review Memo Regarding Potentially Responsible Party Laboratory Data

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255 Shilling Circle, Suite 400
Hunt Valley, MD 21031
Telephone: 765-465-4093

**EA Engineering, Science,
and Technology, Inc. PBC**

10 April 2015

TO: Ted Telisak

FROM: Daniel Hinckley, Ph.D.

SUBJECT: Review of Arkwood PRP Laboratory Dioxin Data

As requested I have reviewed Cardno ChemRisk's dioxin data produced by Vista Analytical Laboratory. Sample Delivery Groups (SDGs) reviewed included 1400785, 1400789, 1400798, 1400800, 1400800 mod run, 1400804, 1400804-01, 1400808, 1400808 mod run, 1400809, and 1400809 mod run. I have verified the following aspects of these data:

- Chain-of-Custody (COC) were completed properly
- Analytical procedures performed were consistent with the COC
- Samples were preserved appropriately
- Sample preparation was consistent with not only standard Incremental Sampling (IS) methodology, but also the special requirements requested by EPA including triplicate subsampling on a given sample (DU3SU1). In addition, the laboratory has re-subsampled some samples (referred to as "mod run") and extracted larger volumes for analytical quantification.
- Dioxin Toxicity Equivalency (TEQ) were calculated correctly
- Dioxin data reported by the laboratory have been reported correctly in Cardno Chemrisk's DRAFT Dioxin Reassessment at Arkwood, Inc. Superfund Site Risk Evaluation of Analytical Data from Decision Unit Sampling

With respect to the data quality associated Vista Analytical the only issue found (and correctly reported) was associated with all SDGs and related to the failure of the 13C-OCDD internal standard. In some samples additional dioxin congeners (e.g. 13C-TCDF) failed standards for the same reason. Recovery of these internal standards were low due to the very large concentrations of OCDD (and other congeners) found in the native samples. This is a common issue, and does not negatively affect the data quality.

Cardno ChemRisk has reported all TCDD TEQ data in Table 1 of the dioxin reassessment document. Variance of TCDD TEQ results from the triplicate subsampling were small, as should be expected from the IS subsampling procedure. While there are some differences between EPA's split sample and Vista Analytical results, they are within acceptable limits.

In summary, the data provided by Vista Analytical is valid and acceptable for use in the project.